there can be no doubt that *Potamogeton flabellatus*, Bab., is what Chamisso and Schlechtendal consider the common form of *P. pectinatus*:" is it impertinent to ask whether they have ever seen Mr. Babington's plant at all? Again, have they any reason to believe that *Carex Davalliana* has been again found near Bath? It seems unquestionable that the former station was destroyed long ago, but it is here spoken of as if still existing. Once more, may we suggest that the remarks on the varieties of *Asplenium filix-fœmina* require correction? there is now an inextricable confusion of the present and the former wording.

We ought not to close this notice without again bearing witness to the richness of knowledge and courtesy of tone which distinguish the 'British Flora.' It may not be of absolute authority on controverted questions: but, besides acting as a useful check on those whose faults are of an opposite tendency, it supplies a large fund of valuable information not otherwise accessible.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

April 26, 1855.—Sir Benjamin Brodie, Bart., V.P., in the Chair.

"Some Observations on the Ova of the Salmon, in relation to the distribution of Species; in a letter addressed to Charles Darwin, Esq., M.A., V.P.R.S. &c." By John Davy, M.D., F.R.SS. Lond. & Edinb.

In this paper the author describes a series of experiments on the ova of the Salmon, made with the intent of ascertaining their power of endurance under a variety of circumstances without loss of life, with the expectation suggested by Mr. Darwin, that the results might possibly throw some light on the geographical distribution of fishes.

The details of the experiments are given in five sections. The results obtained were the following:—

1. That the ova of the Salmon in their advanced stage can be exposed only for a short time to the air if dry, at ordinary temperatures, without loss of life; but for a considerable time, if the temperature be low, and if the air be moist; the limit in the former case not having exceeded an hour, whilst in the latter it has exceeded many hours.

2. That the vitality of the ova was as well preserved in air saturated with moisture, as it would have been had they been in water.

3. That the ova may be included in ice without loss of vitality, provided the temperature is not so low as to freeze them.

4. That the ova, and also the fry recently produced, can bear for some time a temperature of about 80° or 82° in water, without materially suffering; but not without loss of life, if raised above 84° or 85°.

5. That the ova and young fry are speedily killed by a solution

of common salt nearly of the specific gravity of sea-water, viz. 1026; and also by a weaker solution of specific gravity 1016.

Finally, in reference to the inquiry regarding the distribution of the species of fishes, he expresses his belief that some of the results may be of useful application, especially those given in the second and third sections; inferring, that as in moist air, the vitality of the ova is capable of being long sustained, they may during rain or fog be conveyed from one river or lake to another adhering to some part of an animal, such as a Heron or Otter, and also during a time of snow or frost; and, further, that other of the results may be useful towards determining the fittest age of ova for transport for the purpose of stocking rivers, and likewise as a help to explain the habitats, and some of the habits of the migratory species.

"Brief sketch of the Anatomy of a new genus of pelagic Gasteropoda, named *Jasonilla*." By John Denis Macdonald, Esq., R.N.

This communication refers to a remarkable genus of pelagic Gasteropoda, characterized, like *Macgillivraya* and *Cheletropis*, by the presence of ciliated cephalic appendages, but having, as in the present instance, a beautifully transparent, cartilaginous and perfectly symmetrical shell. The author has seen but one species, which was frequently taken between Port Jackson and the Isle of Pines.

The shell resembles that of *Argonauta* in shape, is less than one-eighth of an inch in diameter, and the little animal, when fully retracted, occupies but a small portion of its cavity. The margin of the mantle is of considerable thickness, containing loosely-packed cells, similar to those of the middle or operculigerous lobe of many Pteropods. About eight ciliated arms, identical in character with those of *Macgillivraya*, &c., encircle the head, including the mouth, which is furnished with two massive lateral jaws bearing sharp prominent dental processes on the anterior border, and with a pair of simple tentacula having a dark ocellus at the outer side of the base of each. A well-formed foot arises by a narrow pedicle from the under surface of the body, immediately behind the ciliated collar. The creeping disc is elongated in form, subquadrate in front, and tapers off gradually towards the posterior extremity. The latter part, corresponding to the operculigerous lobe of other species, is speckled with little clusters of dark pigment-cells, disposed so much after the manner of those of the ciliated arms as to lead to the impression that it is one of the same series, or whorl of organs, to use botanical phraseology. A pectinate gill extends beneath the mantle, along the anterior third of the dorsal region, lying, as in most cases, in advance of the heart. The visceral mass of the body, though elongated, is but slightly curved upon itself, not exceeding half a turn. The lobules of the liver, distended with large amber-coloured oil-globules, may be distinctly seen through the transparent outer envelope and shell. Single spherical otolithes are contained in the acoustic sacs, and the lingual ribbon is lengthy and flexuous, presenting a row of uncini on each side, with a series of minute denticulations, pointing backwards on their anterior and posterior

borders. The uncini of opposite sides interlock with one another so closely as to conceal the rudimentary segments of the rachis almost completely. The shell is cartilaginous, transparent, planorbicular, and perfectly symmetrical, presenting four rows of minute conical tuberculations on its convex or dorsal surface. The gyri of the involute nucleus are so curved as to leave a central perforation; the mouth of the tube encroaches considerably on the last whorl, and the outer lip is deeply notched between the two lateral rows of tubercles. The author has named the species *Jasonilla M^c^Leayiana*. The paper is accompanied with illustrative figures.

June 14.—The Lord Wrottesley, President, in the Chair.

"Researches on the Foraminifera.—Part I. General Introduction, and Monograph of the Genus *Orbitolites*." By William B. Carpenter, M.D., F.R.S., F.G.S. &c.

The group of *Foraminifera* being one as to the structure and physiology of which our knowledge is confessedly very imperfect, and for the natural classification of which there is consequently no safe basis, the author has undertaken a careful study of some of its chief typical forms, in order to elucidate (so far as may be possible) their history as living beings, and to determine the value of the characters which they present to the systematist. In the present memoir, he details the structure of one of the lowest of these types, *Orbitolites*, with great minuteness; his object having been, not merely to present the *results* of his investigations, but also to exhibit the *method* by which they have been attained; that method essentially consisting in the minute examination and comparison of a *large number* of specimens.

The *Orbitolite* has been chiefly known, until recently, through the abundance of its *fossil* remains in the Eocene beds of the Paris basin; but the author, having been fortunate enough to obtain an extensive series of *recent* specimens, chiefly from the coast of Australia, has applied himself rather to these as his sources of information; especially as the *animals* of some of them have been sufficiently well preserved by immersion in spirits, to permit their characters to be well made out.

As might have been anticipated from our knowledge of their congeners, these animals belong to the *Rhizopodous* type; the soft body consisting of *sarcode*, without digestive cavity or organs of any kind; and being made up of a number of segments, equal and similar to each other, which are arranged in concentric zones round a central nucleus. This body is invested by a calcareous shell, in the substance of which no minute structure can be discerned, but which has the form of a circular disk, marked on the surface by concentric zones of closed cells, and having minute pores at the margin. Starting from the central nucleus,—which consists of a pear-shaped mass of sarcode, nearly surrounded by a larger mass connected with it by a peduncle,—the development of the Orbitolite may take place either upon a *simple*, or upon a *complex* type. In the former (which

is indicated by the *circular* or *oval* form of the cells which show themselves at the surfaces of the disk, and by the *singleness* of the row of marginal pores), each zone consists of but a single layer of segments, connected together by a single annular stolon of sarcode; and the nucleus is connected with the first zone, and each zone with that which surrounds it, by radiating peduncles proceeding from this annulus, which, when issuing from the peripheral zone, will pass outwards through the marginal pores, probably in the form of *pseudopodia*. In the *complex* type, on the other hand (which is indicated by the *narrow* and *straight-sided* form of the superficial cells, and by the *multiplication* of the horizontal rows of marginal pores), the segments of the concentric zones are elongated into vertical columns with imperfect constrictions at intervals; instead of a single annular stolon, there are two, one at either end of these columns, between which, moreover, there are usually other lateral communications; whilst the radiating peduncles, which connect one zone with another, are also multiplied, so as to lie in several planes. Moreover, between each annular stolon and the neighbouring surface of the disk, there is a layer of superficial segments, distinct from the vertical columns, but connected with the annular stolons; these occupy the narrow elongated cells just mentioned, which constitute two *superficial* layers in the disks of this type, between which is the *intermediate* layer occupied by the columnar segments.

These two types seem to be so completely dissimilar, that they could scarcely have been supposed to belong to the same species; but the examination of a large number of specimens shows, that although one is often developed to a considerable size upon the simple type, whilst another commences even from the centre upon the complex type, yet that many individuals which begin life, and form an indefinite number of annuli, upon the simple type, then take on the more complex mode of development.

The author then points out what may be gathered from observation and from deduction respecting the *Nutrition* and mode of *Growth* of these creatures. He shows that the former is probably accomplished, as in other Rhizopods, by the entanglement and drawing in of minute vegetable particles, through the instrumentality of the pseudopodia; and that the addition of new zones probably takes place by the extension of the sarcode through the marginal pores, so as to form a complete annulus, thickened at intervals into segments, and narrowed between these into connecting stolons, the shell being probably produced by the calcification of their outer portions. And this view he supports by the results of the examination of a number of specimens, in which *reparation of injuries* has taken place. Regarding the *Reproduction* of Orbitolites, he is only able to suggest that certain minute spherical masses of sarcode, with which some of the cells are filled, may be *gemmules*; and that other bodies, enclosed in firm envelopes, which he has more rarely met with, but which seem to break their way out of the superficial cells, may be *ova*. But on this part of the inquiry, nothing save observation of the animals in their living state can give satisfactory results.

The regular type of structure just described is subject to numerous *variations*, into a minute description of which the author next enters; the general results being, that neither the shape nor dimensions of the entire disk, the size of the nucleus or of the cells forming the concentric zones, the surface-markings indicating the shape of the superficial cells, nor the early mode of growth (which, though typically *cyclical*, sometimes approximates to a *spiral*), can serve as distinctive characters of *species*; since, whilst they are all found to present most remarkable differences, these differences, being strictly gradational, can only be considered as distinguishing *individuals*. It thus follows that a very wide *range of variation* exists in this type; so that numerous forms which would be unhesitatingly accounted specifically different, if only *the most divergent examples* were brought into comparison, are found, by the discovery of those *intermediate links* which a large collection can alone supply, to belong to one and the same specific type.

After noticing some curious *monstrosities*, resulting from an unusual outgrowth of the central nucleus, the author proceeds to inquire into the *essential character* of the Orbitolite, and its relations to other types of structure. He places it among the very lowest forms of Foraminifera; and considers that it approximates closely to sponges, some of which have skeletons not very unlike the calcareous net-work which intervenes between its fleshy segments. Of the *species* which the genus has been reputed to include, he states that a large proportion really belong to the genus *Orbitoides*, whilst others are but varieties of the ordinary type. This last is the light in which he would regard the *Orbitolites complanata* of the Paris basin; which differs from the fully-developed Orbitolite of the Australian coast in some very peculiar features (marking a less complete evolution), which are occasionally met with among recent forms, and which are sometimes distinctly transitional towards the perfect type.

The author concludes by calling attention to some general principles, which arise out of the present inquiry, but which are applicable to all departments of Natural History, regarding the *kind* and *extent* of comparison on which alone specific distinctions can be securely based.

June 21.—The Lord Wrottesley, President, in the Chair.

"Notes on British Foraminifera." By J. Gwyn Jeffreys, Esq., F.R.S.

Having, during a great many years, directed my attention to the recent Foraminifera which inhabit our own shores, I venture to offer a few observations on this curious group, as Dr. Carpenter, who has favoured the Society with an interesting and valuable memoir on the subject, seems not to have had many opportunities of studying the animals in the recent state.

Rather more than twenty years ago I communicated to the Linnæan Society a paper on the subject, containing a diagnosis and figures of all the species. This paper was read and ordered to be

printed in the Transactions of that Society; but it was withdrawn by me before publication, in consequence of my being dissatisfied with D'Orbigny's theory (which I had erroneously adopted), that the animals belonged to the Cephalopoda; and my subsequent observations were confirmed by the theory of Dujardin. I have since placed all my drawings and specimens at the disposal of Mr. Williamson of Manchester, who has given such a good earnest of what he can do in elucidating the natural history of this group, by his papers on *Lagena* and the Foraminiferous mud of the Levant.

The observations which I have made on many hundred recent and living specimens of various species, fully confirm Dr. Carpenter's view as to the simple and homogeneous nature of the animal. His idea of their reproduction by gemmation is also probably correct; although I cannot agree with him in considering the granules which are occasionally found in the cells as ova. These bodies I have frequently noticed, and especially in the *Lagenæ*; but they appeared to constitute the entire mass, and not merely a part of the animal. I am inclined to think they are only desiccated portions of the animal, separated from each other in consequence of the absence of any muscular or nervous structure. It may also be questionable if the term "ova" is rightly applicable to an animal which has no distinct organs of any kind. Possibly the fry may pass through a metamorphosis, as in the case of the Medusa.

Most of the Foraminifera are free, or only adhere by their pseudopodia to foreign substances. Such are the *Lagena* of Walker, *Nodosaria*, *Vorticialis* and *Textularia*, and the *Miliola* of Lamarck. The latter has some, although a very limited, power of locomotion; which is effected by exserting its pseudopodia to their full length, attaching itself by them to a piece of seaweed, and then contracting them like india-rubber, so as to draw the shell along with them. Some of the acephalous mollusks do the same by means of their byssus. This mode of progression is, however, exceedingly slow; and I have never seen, in the course of twenty-four hours, a longer journey than a quarter of an inch accomplished by a *Miliola*, so that, in comparison with it, a snail travels at a railroad pace.

Some are fixed or sessile, but not cemented at their base like the testaceous annelids. The only mode of attachment appears to be a thin film of sarcose. The *Lobatula* of Fleming, and the *Rosalia* and *Planorbulina* of D'Orbigny belong to this division.

Dr. Carpenter considers the Foraminifera to be phytophagous, in consequence of his having detected in some specimens, by the aid of the microscope, fragments of *Diatomaceæ* and other simple forms of vegetable life. But as I have dredged them alive at a depth of 108 fathoms (which is far below the Laminarian zone), and they are extremely abundant at from 40 to 70 fathoms, ten miles from land and beyond the range of any seaweed, it may be assumed without much difficulty, that many, if not most of them, are zoophagous, and prey on microscopic animals, perhaps even of a simpler form and structure than themselves. They are in their turn the food of mollusca, and appear to be especially relished by *Dentalium Entale*.

With respect to Dr. Carpenter's idea that they are allied to sponges, I may remark that *Polystomella crispa* (an elegant and not uncommon species) has its periphery set round at each segment with siliceous spicula, like the rowels of a spur. But as there is only one terminal cell, which is connected with all the others in the interior by one or more openings for the pseudopodia, the analogy is not complete, this being a solitary, and the sponge a compound or aggregate animal.

I believe the geographical range or distribution of species in this group to be regulated by the same laws as in the Mollusks and other marine animals. In the gulf of Genoa I have found (as might have been expected) species identical with those of our Hebridean coast, and *vice versâ*.

In common with Dr. Carpenter, I cannot help deploring the excessive multiplication of species in the present day, and I would include in this regret the unnecessary formation of genera. Another Linnæus is sadly wanted to correct this pernicious habit, both at home and abroad.

The group now under consideration exhibits a great tendency to variation of form, some of the combinations (especially in the case of *Marginulina*) being as complicated and various as a Chinese puzzle. It is, I believe, undeniable, that the variability of form is in an inverse ratio to the development of animals in the scale of Nature.

Having examined thousands (I may say myriads) of these elegant organisms, I am induced to suggest the following arrangement:—

1. *Lagena* (Walker) and *Entosolenia* (Williamson).
2. *Nodosaria* and *Marginulina* (D'Orb.), &c.
3. *Vorticialis* (D'Orb.), *Rotalia* (Lam.), *Lobatula* (Flem.), *Globigerina* (D'Orb.), &c.
4. *Textularia* (Defrance), *Uvigerina* (D'Orb.), &c.
5. *Miliola* (Lam.), *Biloculina* (D'Orb.), &c.

This division must, however, be modified by a more extended and cosmopolitan view of the subject, as I only profess to treat of the British species. To illustrate MacLeay's theory of a quinary and circular arrangement, the case may be put thus.

The first family is connected by the typical genus *Lagena* with the second, and by *Entosolina* with the fifth; the second is united

with the third through *Marginulina*; the third with the fourth through *Globigerina*; and the fourth with the last through *Uvigerina*.

Whether these singular and little-known animals are Rhizopodes, or belong to the Amœba, remains yet to be satisfactorily made out.

London, June 18, 1855.

LINNÆAN SOCIETY.

January 16, 1855.—Thomas Bell, Esq., President, in the Chair.

Read, an extract from a Letter, addressed by the Rev. William Henry Hawker to the President, dated "Horndean, Hants, Dec. 11, 1854." After referring to his previous discovery of *Asplenium fontanum* in the neighbourhood of his place of residence, Mr. Hawker proceeds as follows:—

"My discoveries of the past year are not altogether without interest. Last year I paid a visit to the English Lakes, and had the good fortune to find *Polystichum Lonchitis* growing near Ulleswater. I brought away one plant and sent a frond to Newman, who, however, does not mention it in his new Edition. This year (in July) I went to the Lakes again and had the pleasure of confirming the above discovery; and, moreover, on my mentioning it to other collectors, a search was instituted, which has resulted in its turning up in several new localities in that district, *e. g.* Helvellyn, Fairfield, &c. This fern has never before, I believe, been found in the Lake country. Whilst there this year I went a few days' botanical ramble with Mr. Clowes of Windermere, and on one of these days, whilst clambering on a terrific precipice, I had the delight to find *Aspl. septentrionale* growing in such quantity, that I took away I suppose between 60 and 70 plants and left more than 100, and here right amongst them I found 2 plants of *Asplenium germanicum*! A guide was with me, who found close by *Woodsia Ilvensis* growing in some quantity. Three good things were they not, to be growing on a spot only a few yards square? It was on an outcrop of iron ore, which seems to me always to be a good 'matrix' (?) for ferns. This took place not many miles from Scaw Fell, though not on it. It was of course plain that the locality had never been before visited by a botanist. Mr. Clowes found *Euphorbia Cyparissias* growing on Whitbarrow Fells in great quantity. I have gathered it on the mountain limestone of Somersetshire near Wells, and I should think it will prove to be a true native; on the continent it is the commonest of weeds, especially where there is limestone. I followed your advice about keeping the *Helix Pomatia* till the spring, when I fed them up and kept them till impregnated, and then turned them out. The dry summer was rather against them, but I dare say they are all right, though I have not searched for them since. I have found another rare shell in the Ashford woods, *Clausilia Rolphii*—I think about its fifth or sixth locality in England.